

**BOLSA CHICA LOWLANDS RESTORATION PROJECT
2008 MAINTENANCE DREDGING
SEDIMENT CHARACTERIZATION AND
COMPATIBILITY TESTING RESULTS**

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TABLE OF CONTENTS

SUMMARY.....	1
1.0 INTRODUCTION.....	1
1.1 Proposed Project.....	4
1.2 Sampling and Analysis Plan.....	4
1.3 Goal of Sediment Characterization Study	4
2.0 METHODS AND MATERIALS	4
2.1 Sediment Collection	5
2.1.1 Sample Locations	5
2.1.2 Test Sediment Collection.....	7
2.1.3 Core Logging and Sample Handling	7
3.0 DATA ANALYSES.....	8
3.1 Field Observations of Cores	8
3.2 Grain Size Analyses.....	9
4.0 CONCLUSIONS.....	11
5.0 REFERENCES.....	11

LIST OF FIGURES

Figure 1. Bolsa Chica Lowland Restoration Project Location Map	3
Figure 2. Sample Locations at Tidal Basin and Receiver Site.....	6
Figure 3. Cumulative grain size distribution curves for dredge area and receiver beach.....	10

LIST OF TABLES

Table 1. Sample Locations at Tidal Basin and Receiver Location	5
Table 2. Percent gravel, sand, silt/clay comparisons for dredge and recipient areas.....	9

Appendix A – Field Sampling Logs
Appendix B – Extruded Core Field Photographs
Appendix C – Laboratory Analyses Results

DRAFT SAMPLING AND ANALYSIS PLAN BOLSA CHICA LOWLANDS RESTORATION PROJECT SEDIMENT CHARACTERIZATION STUDY

June 2008

SUMMARY

Maintenance dredging is scheduled to remove approximately 230,000 m³ (300,000 yd³) of accumulated littoral sand from the inlet flood shoal with the placement of this material on the down coast beach as a sand bypass. Special Condition #1 of ACOE Individual Permit #9700-19300-RK has required testing of material for beach use compatibility. A Sampling and Analysis Plan (SAP) was prepared to guide this sampling and testing and was approved by email on May 16, 2008 by Jason Lambert, Corps of Engineers Project Manager for the maintenance dredging. Sampling was conducted on May 22, 2008 in accordance with the submitted SAP. No substantive deviations were made from the sampling program outlined, with good sample recovery in every core and all cores being taken to at or near target sampling depths.

A physical characterization of sediment gradation was completed to verify that the material is compatible with the grain size envelope represented at the receiver beach. Testing procedures for this determination are based on the composite envelope approach developed by the Sand Compatibility and Opportunistic Use Program (SCOUP) (Moffatt & Nichol 1999).

Sediments from the flood shoal to be dredged were determined to be 99% sand with inconsequential components of fine gravel (shell hash) and silt/clay fractions. Similarly, receiver beach areas were determined to exceed 94% sand in all cases and generally maintained higher sand fractions comparable to the shoal. The shoal composite sample and the composite duplicate were verified to fall within the receiver beach grain size composite envelope and thus were determined to be compatible material for beach replenishment at the receiver beach.

1.0 INTRODUCTION

In 1996, eight state and federal agencies entered into an agreement to conduct wetland acquisition and restoration at the Bolsa Chica Lowlands in Orange County, California. Following project planning, land purchase, restoration design, permit acquisition, and publication of a Final Environmental Impact Statement/Final Environmental Impact Report, restoration construction began on October 6, 2004. The project involved the creation of a Full Tidal Basin (FTB) and restoration of Muted Tidal Basins (MTB) by constructing an ocean inlet north of Huntington Mesa.

To create the full tidal basin, approximately 1.57 million m³ (2.1 million yd³) of material were excavated from within the Bolsa Chica Lowlands to create a basin of a general depth of -1m NAVD, bounded by intertidal flats. The excavated sand was distributed on the adjacent beaches from March to June 2006 (102,500 m³ [134,064 yd³], divided evenly to the north and south of the future inlet) and placed offshore from November 2005 to May 2006 to form an

ebb bar (929,326 m³ [1,215,512 yd³]) outside of the future inlet. Approximately 531,354 m³ (694,985 yd³) of material was placed to form the basin levees and three nesting areas. Remaining material was hauled off-site. Jetties were constructed to form the ocean inlet to the basin from March through June of 2006.

The Full Tidal Basin was opened to the ocean on August 24, 2006. The basin was designed to support 71.0 hectares (ha) (175.5 acres) of non-wetland waters, 49.6 ha (122.6 acres) of tidal flats, and 7.7 ha (19.1 acres) of pickleweed. In order to keep the inlet open, it is anticipated that maintenance dredging will be needed on a biennial basis, with dredged sand to be placed on down-coast beaches.

Water control structures and culverts through the levee were installed to allow regular but muted tidal influence from the FTB to three MTBs (Figure 1). The Muted Tidal Basins were not opened to the Full Tidal Basin during the first year of the monitoring program, though all are scheduled to be opened in 2008. The westernmost structure was opened in April 2008. Other structures will be opened in the fall of 2008. The project involved no changes to the Future Full Tidal Basin or the Seasonal Ponds.

Project work was authorized under IP (9700-19300-RK). Special Condition 1 of this permit authorizes two rounds of maintenance dredging as follows: *“This permit authorizes the construction of the project described herein (or as modified by the Permittees and approved by the Corps under Special Condition 5 below). In addition, this permit authorizes two maintenance-dredging operations, providing additional analysis are submitted to the Corps, Regulatory Branch, and demonstrate material suitability and compatibility, per the Inland Testing Manual (Corps/EPA). If Regulatory Branch does not provide approval letter within 45-days of receipt, the Permittee(s) can assume approval.”* This testing program is intended to comply with the requirements of Special Condition 1 of 9700-19300-RK.

Flood shoaling has occurred within the FTB at a two-year rate that is nearly precisely as predicted, with a greater rate of shoaling in Year 1 and a lesser rate of shoaling in Year 2 than expected. The shoal geometry is also generally as expected. The scheduled maintenance dredging is expected to remove the volume predicted at the frequency planned. For this reason, there is no reason not to proceed with the maintenance dredging as scheduled and permitted under the existing project permits. Based on the minor beach erosion down-coast of the inlet and the beach expansion up-coast of the inlet, it is appropriate to place dredged sands only to the south of the inlet as dictated by the existing permits.



Figure 1. Bolsa Chica Lowland Restoration Project Location Map

1.1 PROPOSED PROJECT

Maintenance dredging will remove shoaled sediments and return the FTB to as-built design depths. The first scheduled maintenance-dredging event is anticipated to remove approximately 230,000 m³ (300,000 yd³) of sand from the flood shoal and bypass this material to the down coast beach. Dredging mobilization is scheduled to occur in September 2008, with completion prior to March 15, 2009.

1.2 SAMPLING AND ANALYSIS PLAN

The SAP (Merkel & Associates 2008) details the sediment collection and testing program to be conducted on the proposed dredged material in accordance with the standard procedures outlined in Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. (Inland Testing Manual [ITM]) (EPA/USACE 1998) and regional guidance of the USACE regulatory branch (USACE 1991). These guidance documents apply to inland waters, near-coastal waters, and surrounding environs.

This study included:

- Preparation of a SAP for Army Corps of Engineers approval.
- Collection of sediment core samples to project depth according to the procedures outlined in the approved SAP.
- Physical analyses on test sediment composites for the flood shoal to be dredged and receiver beach.
- Data analysis and report preparation.

Merkel & Associates, Inc. (M&A), under contract to California State Lands Commission (CSLC), managed the sediment collection and testing study.

1.3 GOAL OF SEDIMENT CHARACTERIZATION STUDY

The purpose of this sediment characterization study was to verify compatibility of flood shoal sands from the FTB with beach nourishment of the down coast beach. As the present shoal material represents an interception of littoral sands, the replacement down coast would be a sand bypass project. The material met standards for a Tier 1 testing exclusion and as such, no sediment chemistry testing was performed. However, as this dredging cycle constitutes the first maintenance dredging of the Bolsa Chica Wetlands inlet flood shoal, beach compatibility testing was required to demonstrate suitability of sand material for placement on down the coast receiver beach as required under the Corps Permit and Coastal Consistency Determination.

2.0 METHODS AND MATERIALS

Physical characterization of sediment gradation will be completed to verify that the material is compatible with the grain size envelope represented at the receiver beach. Testing procedures for this determination were based on the composite envelope approach developed by the Sand Compatibility and Opportunistic Use Program (SCOUP) (Moffatt & Nichol

1999). This also conforms to the protocols required under the Corps' RGP 67 for such compatibility testing.

2.1 SEDIMENT COLLECTION

2.1.1 Sample Locations

Bolsa Chica Tidal Basin

Ten sample locations were sampled in accordance with the SAP. Locations were selected to best characterize the sediment within the FTB (Figure 2). Samples were to be collected to the as-built design depth at each location, with target and actual penetration for each location provided in the Table 1.

Table 1. Sample Locations at Tidal Basin and Receiver Location

Site	Sample Location	Longitude	Latitude	Existing Elevation (NAVD ft)	Design Elevation (NAVD ft)	Target Penetration (ft)	Actual Penetration (ft)
Shoal (Basin)	S-1	118° 2.091	33° 41.046	2.9	-4.3	7.1	7.0
	S-2	118° 2.062	33° 41.077	3.3	-4.3	7.0	7.0
	S-3	118° 2.033	33° 41.062	-0.9	-4.6	3.7	4.0
	S-4	118° 2.079	33° 41.111	0	-4.3	4.3	4.5
	S-5	118° 2.013	33° 41.127	1.6	-4.9	6.5	6.0
	S-6	118° 2.039	33° 41.157	1.6	-4.6	6.2	6.0
	S-7	118° 2.070	33° 41.176	0.3	-4.6	4.9	5.0
	S-8	118° 2.011	33° 41.215	0.6	-4.6	5.0	5.0
	S-9	118° 2.038	33° 41.250	0.9	-4.3	5.2	5.0
	S-10	118° 2.007	33° 41.298	0.9	-4.6	5.5	5.5
Receiver Site (Beach)	R-1	118° 2.076	33° 40.878	+12	NA	0.5	0.5
	R-2	118° 2.093	33° 40.866	+6	NA	0.5	0.5
	R-3	118° 2.111	33° 40.851	0	NA	0.5	0.5
	R-4	118° 2.139	33° 40.827	-6	NA	0.5	0.5
	R-5	118° 2.169	33° 40.808	-12	NA	0.5	0.5
	R-6	118° 2.194	33° 40.786	-18	NA	0.5	0.5
	R-7	118° 2.217	33° 40.770	-24	NA	0.5	0.5
	R-8	118° 2.242	33° 40.751	-30	NA	0.5	0.5
	R-9	118° 1.833	33° 40.674	+12	NA	0.5	0.5
	R-10	118° 1.852	33° 40.660	+6	NA	0.5	0.5
	R-11	118° 1.873	33° 40.644	0	NA	0.5	0.5
	R-12	118° 1.898	33° 40.624	-6	NA	0.5	0.5
	R-13	118° 1.924	33° 40.606	-12	NA	0.5	0.5
	R-14	118° 1.945	33° 40.588	-18	NA	0.5	0.5
	R-15	118° 1.967	33° 40.569	-24	NA	0.5	0.5
	R-16	118° 1.991	33° 40.552	-30	NA	0.5	0.5



Figure 2. Sample Locations at Tidal Basin and Receiver Site

Receiver Site

The broadest range of all receiver site grain size distribution curves represented in the sampling defines a representative composite grain size envelope. Samples were collected along transects that ran out across the littoral cell approximately perpendicular to the shoreline (Figure 2). Two profiles were sampled for a receiving beach in accordance with the SAP and SCoup compatibility assessment methods (M&N 2006)

2.1.2 Test Sediment Collection

One core sample was taken at each of the sampling locations with the use of a driven vibracore. Sediment collection, handling, and preservation activities followed the procedures outlined in the ITM. Analyses will follow procedures outlined in the SCoup composite envelope approach (M&N 2006).

Sampling stations were located using a differential global positioning system (DGPS) that provides latitude and longitude. The accuracy of the DGPS system used for this sampling event was ± 3 m.

Receiver site samples were collected at every 6-foot change in elevation from MLLW (i.e., from the backshore to the local closure depth). The highest portion of the backshore is considered the landward boundary of the beach, and the seaward limit is the depth of closure (e.g., typically 30 feet in Southern California). Profiles were sampled at elevations of +12, +6, 0, -6, -12, -18, -24, and -30 feet MLLW. Samples consisted of at least 100 grams, collected in 1-gallon bags. Sampling was performed by hand coring the upper 6 inches of sediment depth (USACE 1989) and placing the collected material into sample containers.

2.1.3 Core Logging and Sample Handling

Core samples from the flood shoal sampling were extruded onto ABS trays, photographed, and reviewed for unique strata, color, odors, etc. These observations, along with information on weather, currents, tides, winds, and other site conditions, were recorded in the field log.

The following information was recorded during the sediment collection program in a project-specific field log (Appendix A):

- Date and time of collection
- Sample identification code
- Sampling location (latitude/longitude to within a 3-meter accuracy)
- Water depth or elevation (± 0.1 ft)
- Tidal stage and currents
- Climatic conditions
- Sampling method and any problems encountered
- Core penetration/core recovery
- Description of the material type obtained in the samples (color, odor, etc.)
- Description of any vertical stratification in each core
- Description of sediment subsampling methods

Each core sample was thoroughly homogenized and subsampled for archival purposes. The sediment collected from cores within the dredge area were subsequently composited and sampled for physical analyses.

Archived sediments have been frozen and will be disposed of within 120-days of the sampling date. The project area composites were archived in labeled 16-oz (500 ml) glass jars with teflon-lined lids and frozen. The individual core sample grain size archive samples were placed in food-grade plastic bags and stored at room temperature.

Sample container identification information was recorded on chain-of-custody forms and each sampling container, as well as on a waterproof interior label.

3.0 DATA ANALYSES

3.1 FIELD OBSERVATIONS OF CORES

As indicated in field logs, the cores consisted of continuous profiles of brown (dry) and gray (wet) sand. Material was not cohesive and readily eroded with water although the drier cores readily segmented while retaining their initial cylindrical shape. No distinct strata were noted in any sampled cores with the entire length of each core consisting of fine sands with no observable clays/silts, or organic layers. Photographs of all cores are found in Appendix B.



Photograph of typical core segment from Bolsa Chica flood shoal dredge area.

3.2 GRAIN SIZE ANALYSES

Grain size analyses will be performed on the test composite and receiver site samples following the EPA/USACE-approved sieve and hydrometer method (ASTM 1967). Percent sand, silt, and clay have been reported to 0.01 percent, along with the corresponding diameter in millimeters and cumulative grain size distribution curves (Figure 3).

Grain size samples for the receiver site were sieved and a gradation curve established for each sample (Figure 3). A composite grain size gradation “envelope” was prepared from all receiver site sample locations using plots of the coarsest and finest grain sizes along the transects and compared to grain size results from the proposed dredged material

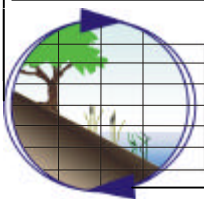
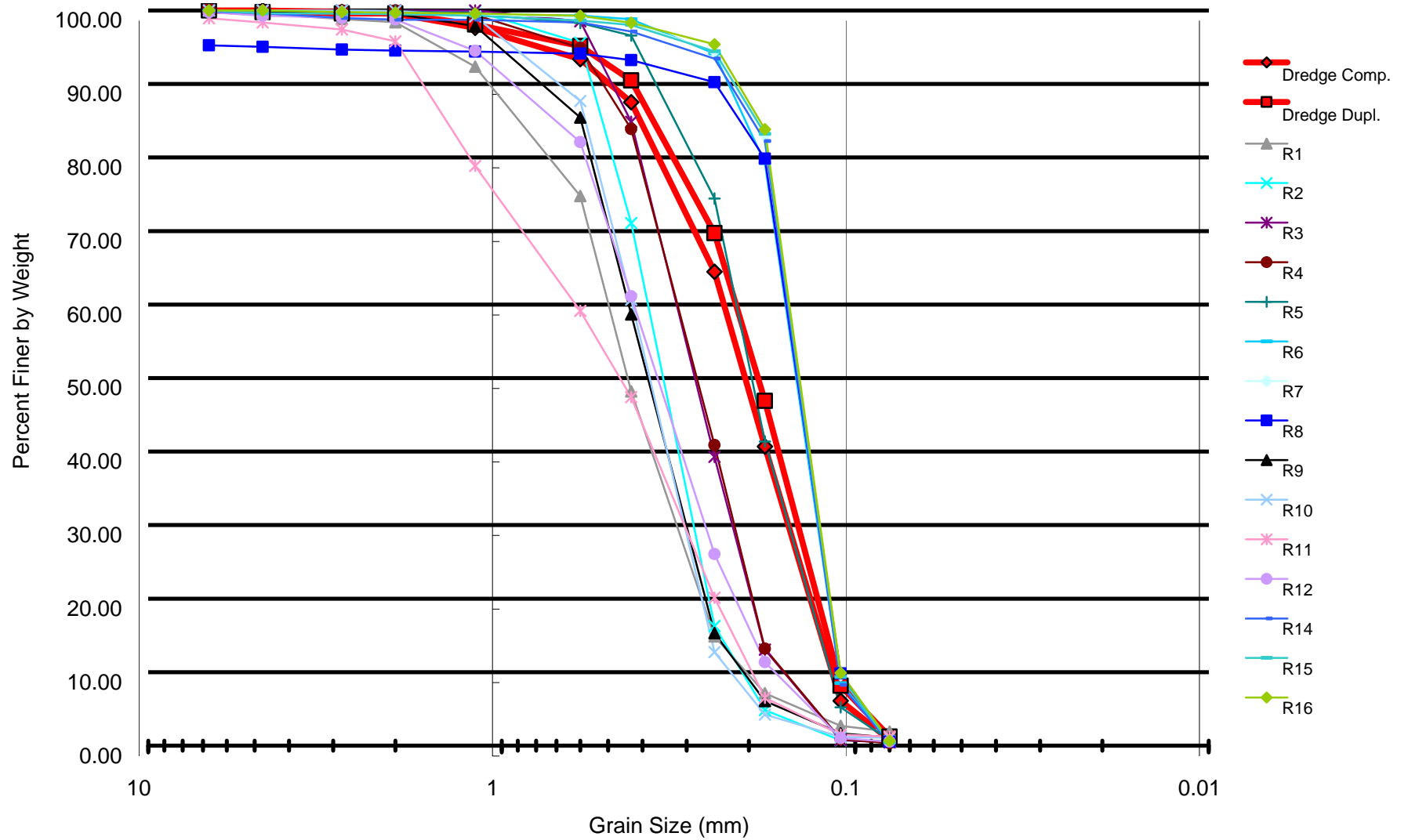
The analyses for the proposed study were as follows:

- One FTB flood shoal dredging area composite was tested for grain size.
- A second FTB flood shoal dredging area composite was run as a lab replicate.
- Sixteen samples (R-1 to R-16) from the receiver beach were tested for grain size.

The results of gravel, sand, silt-clay analyses for each location are summarized in Table 2. The detailed breakdown by sieve is found in Appendix C.

Table 2. Percent gravel, sand, silt/clay comparisons for dredge and recipient areas

SITE	GRAVEL	SAND	SILT/CLAY
DREDGE AREA FLOOD SHOAL CHARACTERIZATION			
Dredge Area Composite	0.2%	99.0%	0.6%
Composite Duplicate	0.4%	98.4%	1.0%
RECIPIENT BEACH CHARACTERIZATION			
R1	1.1%	96.9%	0.5%
R2	0.0%	99.4%	0.0%
R3	0.0%	99.6%	0.0%
R4	0.0%	99.7%	0.0%
R5	0.0%	99.2%	0.3%
R6	0.3%	99.1%	0.4%
R7	0.1%	99.3%	0.5%
R8	5.3%	94.1%	0.5%
R9	0.3%	98.6%	0.5%
R10	0.0%	98.9%	0.1%
R11	2.6%	96.2%	0.0%
R12	1.0%	98.5%	0.0%
R13	0.1%	99.4%	0.3%
R14	1.0%	98.6%	0.4%
R15	0.5%	99.1%	0.4%
R16	0.2%	99.2%	0.5%



Bolsa Chica Maintenance Dredging Program

Grain Size Data
Percent Finer by Weight
May 2008

Figure
3

4.0 CONCLUSIONS

Sediments to be dredged from the Bolsa Chica Wetlands FTB inlet flood shoal were evaluated for compatibility with the down drift receiver beach that is the required recipient of maintenance dredge bypass sands. The material was found to be nearly pure sand at a 99% sand fraction, and the material was well within the central portion of the grain size envelope described by the grain size curves of the receiver beach (Figure 3). Based on these results, the material is highly compatible with the receiver beach.

5.0 REFERENCES

- American Society for Testing and Materials (ASTM). 1967. Standard Methods for Grain-Size Analysis of Soils. ASTM Designation D422- 63, Part II.
- Chamber Group. 2001. Final EIR/EIS for the Bolsa Chica Lowland Restoration Project. April.
- Environmental Protection Agency (EPA)/U.S. Army Corps of Engineers (USACE). 1998. Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S., Testing Manual: Inland Testing Manual. EPA Reference 823-B-98-004. February.
- Moffatt & Nichol (M&N). 1999. Final Report, Preliminary Engineering Inlet Studies for Bolsa Chica Wetlands Restoration. December 1999.
- U.S. Army Corps of Engineers (USACE). 1991. General Recommendations for Sediment Testing of Dredged Material Proposed of Ocean Dumping. December.
- U.S. Army Corps of Engineers (USACE). 1989. San Gabriel River to Newport Beach – Beach replenishment at Surfside-Sunset Beach: U.S. Army Corps of Engineers, Los Angeles District, Geotechnical Report, 5 p.

APPENDIX A FIELD SAMPLING LOGS

BOLSA CHICA MAINTENANCE DREDGING SEDIMENT CHARACTERIZATION STUDY

STATION: S1

DATE: 5-22-08

TIME: 09:25 hrs.

LAT./LONG. NORTH: 118° 2.091

WEST: 33° 41.046

PROJECT DEPTH: _____

WATER DEPTH: 0

TIDE +/-: _____

CORRECTED WATER DEPTH: _____

CORE DEPTH: _____

CORE NUMBER: _____

TARGET PENETRATION: 7.1'

ACTUAL PENETRATION: 7'

PERCENT (actual/target): _____

*target penetration or to refusal

WEATHER: (circle)

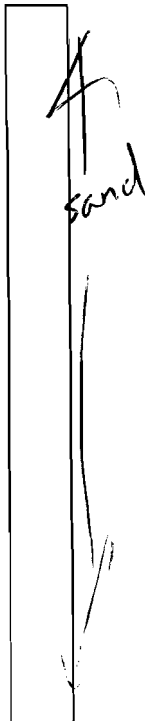
SKY: sunny, partly cloudy, overcast, rain

SEA STATE: BEAUFORT SCALE

0, 1, 2, 3, 4

OBSERVATIONS:

TOP OF CORE



BOTTOM OF CORE

Is there a plug? YES / NO

Is Plug SOLID or LOOSE sand? SOLID / LOOSE

COLOR of plug? TAN, BROWN, GRAY, BLACK, GREEN

GRAINSIZE of plug? COARSE SAND, MEDIUM SAND, FINE SA
TAN CLAY, SANDSTONE

SHELL DEBRIS? YES / NO

SMELL? NONE, ORGANIC, OIL,

OTHER: _____

Does retrieval of core cause an OIL SHEEN?

YES / NO

*Very minimal
≈ 1% oil-s*

ADDITIONAL COMMENTS:

PHOTO TAKEN: YES / NO

RECORDER: STJ

BOLSA CHICA MAINTENANCE DREDGING SEDIMENT CHARACTERIZATION STUDY

STATION: S2
DATE: 5-22-08
TIME: 08:40 hrs.

LAT./LONG.
NORTH: 118° 2.062
WEST: 33° 41.077

PROJECT DEPTH: _____

WATER DEPTH: 0

TIDE +/-: _____

CORRECTED WATER DEPTH: _____

CORE DEPTH: _____

CORE NUMBER: _____

TARGET PENETRATION: 7'

ACTUAL PENETRATION: 7'

PERCENT (actual/target): 100%

*target penetration or to refusal

WEATHER: (circle)

SKY: sunny, partly cloudy, overcast, rain

SEA STATE: BEAUFORT SCALE

0, 1, 2, 3, 4

OBSERVATIONS:

TOP OF CORE



BOTTOM OF CORE

Is there a plug? YES / NO

Is Plug SOLID or LOOSE sand? SOLID / LOOSE

COLOR of plug? TAN, BROWN, GRAY, BLACK, GREEN

GRAINSIZE of plug? COARSE SAND, MEDIUM SAND, FINE SAND, TAN CLAY, SANDSTONE

SHELL DEBRIS? YES / NO

SMELL? NONE, ORGANIC, OIL, OTHER: _____

Does retrieval of core cause an OIL SHEEN? YES / NO

ADDITIONAL COMMENTS:

PHOTO TAKEN: YES / NO

RECORDER: SSJ

BOLSA CHICA MAINTENANCE DREDGING SEDIMENT CHARACTERIZATION STUDY

STATION: 53
 DATE: 5-22-08
 TIME: 09:14 hrs.

LAT./LONG.
 NORTH: 118° 2.033
 WEST: 33° 41.062

PROJECT DEPTH: _____

WATER DEPTH: 0

TIDE +/-: _____

CORRECTED WATER DEPTH: _____

CORE DEPTH: _____

CORE NUMBER: _____

TARGET PENETRATION: 3.7'

ACTUAL PENETRATION: 4'

PERCENT (actual/target): _____

*target penetration or to refusal

WEATHER: (circle)

SKY: sunny, partly cloudy, overcast, rain

SEA STATE: BEAUFORT SCALE

0. 1, 2, 3, 4

OBSERVATIONS:

TOP OF CORE



BOTTOM OF CORE

Is there a plug? YES / NO

Is Plug SOLID or LOOSE sand? SOLID / LOOSE

COLOR of plug? TAN, BROWN, GRAY, BLACK, GREEN

GRAINSIZE of plug? COARSE SAND, MEDIUM SAND, FINE SAND, TAN CLAY, SANDSTONE

SHELL DEBRIS? YES / NO

SMELL? NONE, ORGANIC, OIL,

OTHER: _____

Does retrieval of core cause an OIL SHEEN?

YES / NO

ADDITIONAL COMMENTS:

PHOTO TAKEN: YES / NO

RECORDER: SJT

BOLSA CHICA MAINTENANCE DREDGING SEDIMENT CHARACTERIZATION STUDY

STATION: 54
DATE: 5-22-08
TIME: 08:40 hrs.

LAT./LONG.
NORTH: 118° 2.079
WEST: 33° 41.111

PROJECT DEPTH: _____

WATER DEPTH: 0

TIDE +/-: _____

CORRECTED WATER DEPTH: _____

CORE DEPTH: _____

CORE NUMBER: _____

TARGET PENETRATION: 4.3'

ACTUAL PENETRATION: 4.5'

PERCENT (actual/target): _____

*target penetration or to refusal

WEATHER: (circle)

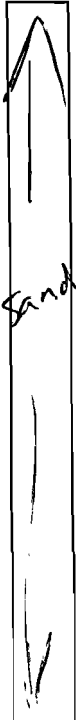
SKY: sunny, partly cloudy, overcast, rain

SEA STATE: BEAUFORT SCALE

0, 1, 2, 3, 4

OBSERVATIONS:

TOP OF CORE



BOTTOM OF CORE

Is there a plug? YES / NO

Is Plug SOLID or LOOSE sand? SOLID / LOOSE

COLOR of plug? TAN, BROWN, GRAY, BLACK, GREEN

GRAINSIZE of plug? COARSE SAND, MEDIUM SAND, FINE SAND, TAN CLAY, SANDSTONE

SHELL DEBRIS? YES / NO

SMELL? NONE, ORGANIC, OIL,

OTHER: _____

Does retrieval of core cause an OIL SHEEN?

YES / NO

ADDITIONAL COMMENTS:

PHOTO TAKEN: YES / NO

RECORDER: STJ

BOLSA CHICA MAINTENANCE DREDGING SEDIMENT CHARACTERIZATION STUDY

STATION: 55
 DATE: 5-22-08
 TIME: 08:06 hrs.

LAT./LONG.
 NORTH: 118° 2.013
 WEST: 33° 41.127

PROJECT DEPTH: _____
 WATER DEPTH: 05'
 TIDE +/-: _____
 CORRECTED WATER DEPTH: _____

CORE NUMBER: _____

TARGET PENETRATION: 6.5'

ACTUAL PENETRATION: 6'

PERCENT (actual/target): _____
 *target penetration or to refusal

WEATHER: (circle)

SKY: sunny, partly cloudy, overcast, rain

SEA STATE: BEAUFORT SCALE

0. 1. 2. 3. 4

OBSERVATIONS:

TOP OF CORE



BOTTOM OF CORE

Is there a plug? YES / NO

Is Plug SOLID or LOOSE sand? SOLID / LOOSE

COLOR of plug? TAN, BROWN, GRAY, BLACK, GREEN

GRAINSIZE of plug? COARSE SAND, MEDIUM SAND, FINE SA
 TAN CLAY, SANDSTONE

SHELL DEBRIS? YES / NO

SMELL? NONE, ORGANIC, OIL,
 OTHER: _____

Does retrieval of core cause an OIL SHEEN?
 YES / NO

ADDITIONAL COMMENTS:

PHOTO TAKEN: YES / NO

RECORDER: SSJ

BOLSA CHICA MAINTENANCE DREDGING SEDIMENT CHARACTERIZATION STUDY

STATION: S6
DATE: 5-22-08
TIME: 07:49 hrs.

LAT./LONG.
NORTH: 118° 2.039
WEST: 33° 41.157

PROJECT DEPTH: _____
WATER DEPTH: 0
TIDE +/-: _____
CORRECTED WATER DEPTH: _____

CORE NUMBER: _____

TARGET PENETRATION: 6.2'

ACTUAL PENETRATION: 6'

PERCENT (actual/target): _____
*target penetration or to refusal

CORE DEPTH: _____

WEATHER: (circle)

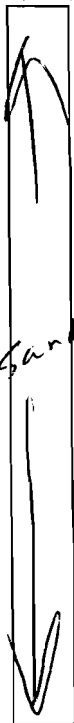
SKY: sunny, partly cloudy, overcast, rain

SEA STATE: BEAUFORT SCALE

0, 1, 2, 3, 4

OBSERVATIONS:

TOP OF CORE



BOTTOM OF CORE

Is there a plug? YES / NO

Is Plug SOLID or LOOSE sand? SOLID / LOOSE

COLOR of plug? TAN, BROWN, GRAY, BLACK, GREEN

GRAINSIZE of plug? COARSE SAND, MEDIUM SAND, FINE SAND, TAN CLAY, SANDSTONE

SHELL DEBRIS? YES / NO

SMELL? NONE, ORGANIC, OIL, OTHER: _____

Does retrieval of core cause an OIL SHEEN?

YES / NO

ADDITIONAL COMMENTS:

PHOTO TAKEN: YES / NO

RECORDER: SSS

BOLSA CHICA MAINTENANCE DREDGING SEDIMENT CHARACTERIZATION STUDY

STATION: S7

DATE: 5-22-08

TIME: 07:41 hrs.

CORE NUMBER: _____

TARGET PENETRATION: 4.9'

ACTUAL PENETRATION: 5'

PERCENT (actual/target): _____

***target penetration or to refusal**

LAT./LONG.
NORTH: 118° 2.070
WEST: 33° 41.176

PROJECT DEPTH: _____

WATER DEPTH: 0

TIDE +/-: _____

CORRECTED WATER DEPTH: _____

CORE DEPTH: _____

WEATHER: (circle)

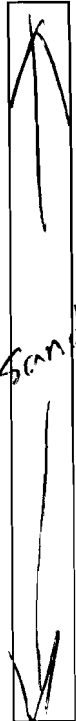
SKY: sunny, partly cloudy, overcast, rain

SEA STATE: BEAUFORT SCALE

0, 1, 2, 3, 4

OBSERVATIONS:

TOP OF CORE



BOTTOM OF CORE

Is there a plug? YES / NO

Is Plug SOLID or LOOSE sand? SOLID / LOOSE

COLOR of plug? TAN, BROWN, GRAY, BLACK, GREEN

GRAINSIZE of plug? COARSE SAND, MEDIUM SAND, FINE SAND,
TAN CLAY, SANDSTONE

SHELL DEBRIS? YES / NO

SMELL? NONE, ORGANIC, OIL,
OTHER: _____

Does retrieval of core cause an OIL SHEEN?

YES / NO

ADDITIONAL COMMENTS:

PHOTO TAKEN: YES / NO

RECORDER: SSJ

BOLSA CHICA MAINTENANCE DREDGING SEDIMENT CHARACTERIZATION STUDY

STATION: 58
DATE: 5-22-08
TIME: 07:21 hrs.

LAT./LONG.
NORTH: 118° 2,011
WEST: 33° 41.215

PROJECT DEPTH: _____
WATER DEPTH: 0
TIDE +/-: _____
CORRECTED WATER DEPTH: _____

CORE NUMBER: _____

TARGET PENETRATION: 5'

ACTUAL PENETRATION: 5'

PERCENT (actual/target): _____
*target penetration or to refusal

CORE DEPTH: _____

WEATHER: (circle)

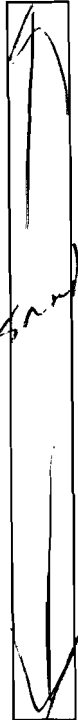
SKY: sunny, partly cloudy, overcast, rain

SEA STATE: BEAUFORT SCALE

0, 1, 2, 3, 4

OBSERVATIONS:

TOP OF CORE



BOTTOM OF CORE

Is there a plug? YES / NO

Is Plug SOLID or LOOSE sand? SOLID / LOOSE

COLOR of plug? TAN, BROWN, GRAY, BLACK, GREEN

GRAINSIZE of plug? COARSE SAND, MEDIUM SAND, FINE SAND,
TAN CLAY, SANDSTONE

SHELL DEBRIS? YES / NO

SMELL? NONE, ORGANIC, OIL,
OTHER: _____

Does retrieval of core cause an OIL SHEEN?
YES / NO

ADDITIONAL COMMENTS:

PHOTO TAKEN: YES / NO

RECORDER: SSJ

BOLSA CHICA MAINTENANCE DREDGING SEDIMENT CHARACTERIZATION STUDY

STATION: S 9

DATE: 5-22-08

TIME: 06:52 hrs.

LAT./LONG.
NORTH: 118° 2.038

WEST: 33° 41.250

PROJECT DEPTH: _____

WATER DEPTH: 0.5'

TIDE +/-: _____

CORRECTED WATER DEPTH: _____

CORE DEPTH: _____

CORE NUMBER: _____

TARGET PENETRATION: 5.2'

ACTUAL PENETRATION: 5'

PERCENT (actual/target): _____

*target penetration or to refusal

WEATHER: (circle)

SKY: sunny, partly cloudy, overcast, rain

SEA STATE: BEAUFORT SCALE

0, 1, 2, 3, 4

OBSERVATIONS:

TOP OF CORE



BOTTOM OF CORE

Is there a plug? YES NO

Is Plug SOLID or LOOSE sand: SOLID / LOOSE

COLOR of plug? TAN, BROWN, GRAY, BLACK, GREEN

GRAINSIZE of plug? COARSE SAND, MEDIUM SAND, FINE SAND,
TAN CLAY, SANDSTONE

SHELL DEBRIS? YES / NO

SMELL? NONE, ORGANIC, OIL,
OTHER: _____

Does retrieval of core cause an OIL SHEEN?
YES / NO

ADDITIONAL COMMENTS:

PHOTO TAKEN: YES / NO

RECORDER: STJ

BOLSA CHICA MAINTENANCE DREDGING SEDIMENT CHARACTERIZATION STUDY

STATION: S10

DATE: 5-22-08

TIME: 06:41 hrs.

LAT./LONG.
NORTH: 118° 2.007

WEST: 33° 41.248

PROJECT DEPTH: _____

WATER DEPTH: 1'

TIDE +/-: _____

CORRECTED WATER DEPTH: _____

CORE DEPTH: 5-5

CORE NUMBER: _____

TARGET PENETRATION: 5.5'

ACTUAL PENETRATION: 5.5'

PERCENT (actual/target): 100%

***target penetration or to refusal**

WEATHER: (circle)

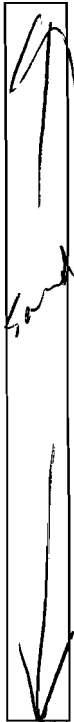
SKY: sunny, partly cloudy, overcast, rain

SEA STATE: BEAUFORT SCALE

0, 1, 2, 3, 4

OBSERVATIONS:

TOP OF CORE



BOTTOM OF CORE

Is there a plug? YES NO

Is Plug SOLID or LOOSE sand: SOLID / LOOSE

COLOR of plug? TAN, BROWN, GRAY, BLACK, GREEN

GRAINSIZE of plug? COARSE SAND, MEDIUM SAND, FINE SAND,
TAN CLAY, SANDSTONE

SHELL DEBRIS? YES / NO

SMELL? NONE, ORGANIC, OIL,

OTHER: _____

Does retrieval of core cause an OIL SHEEN?
YES / NO

ADDITIONAL COMMENTS:

PHOTO TAKEN: YES / NO

RECORDER: SSJ

APPENDIX B

EXTRUDED CORE FIELD PHOTOGRAPHS



Photo 1. Flood Shoal Location S-1

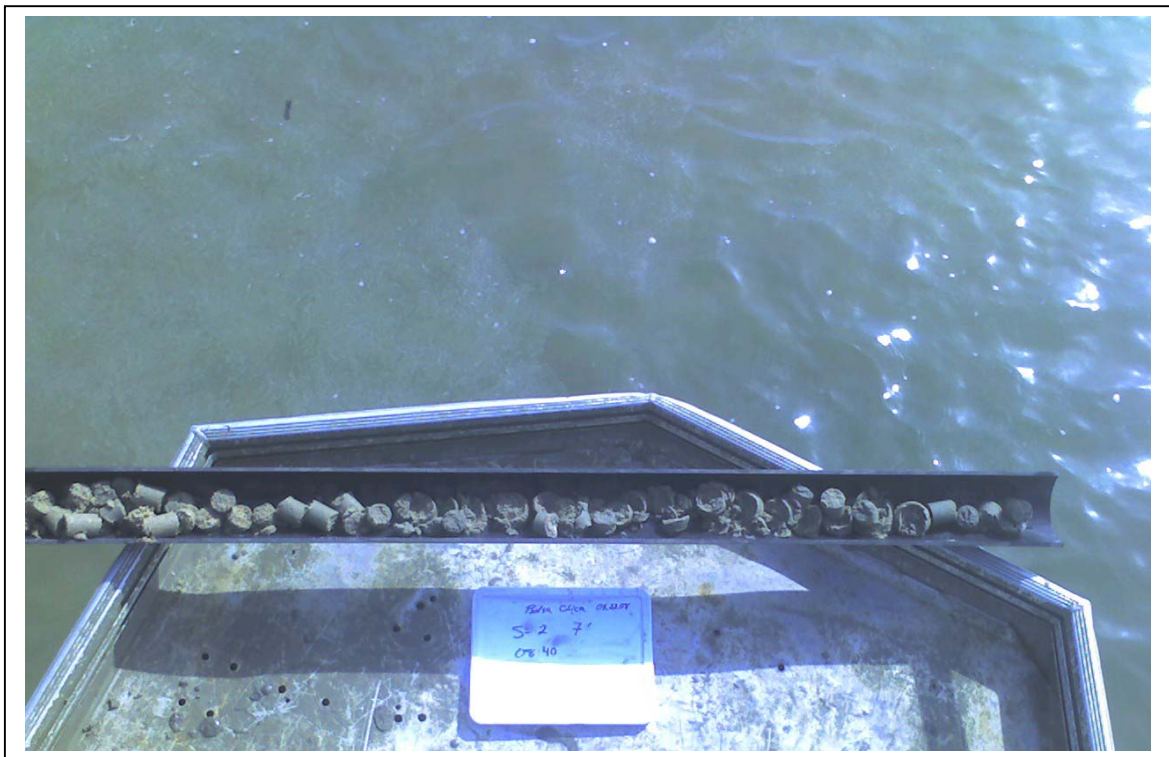


Photo 2. Flood Shoal Location S-2

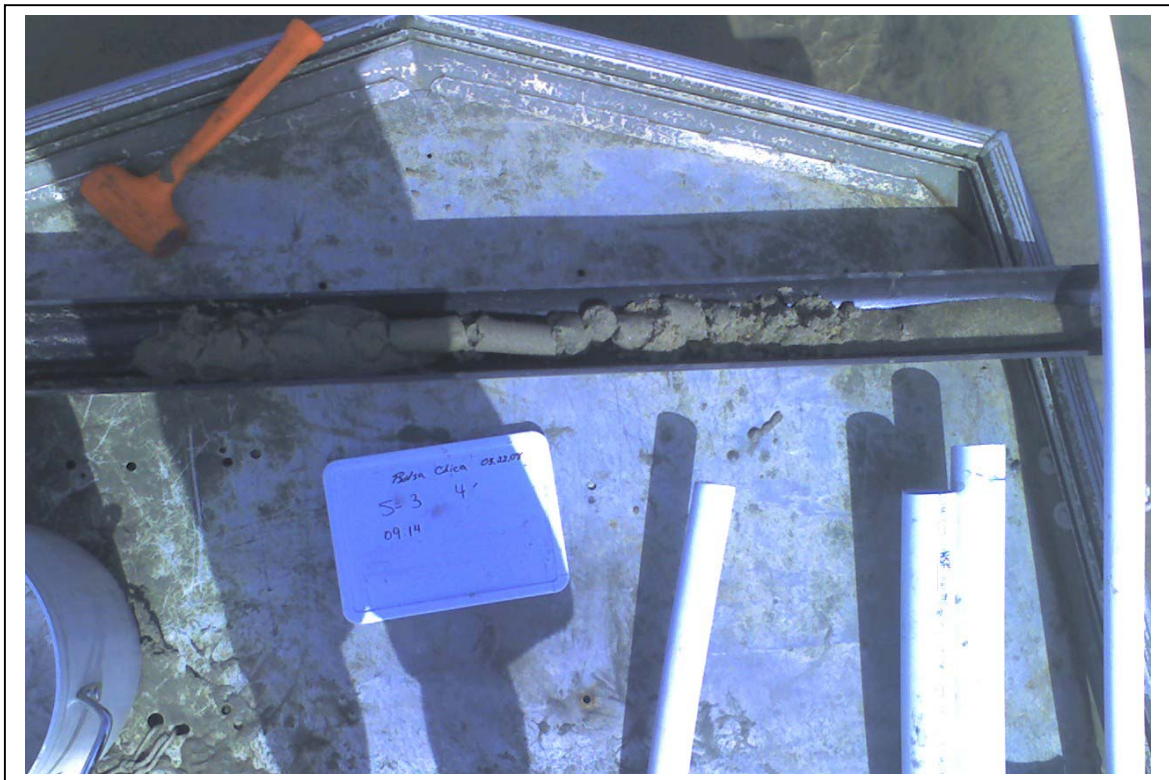


Photo 3. Flood Shoal Location S-3

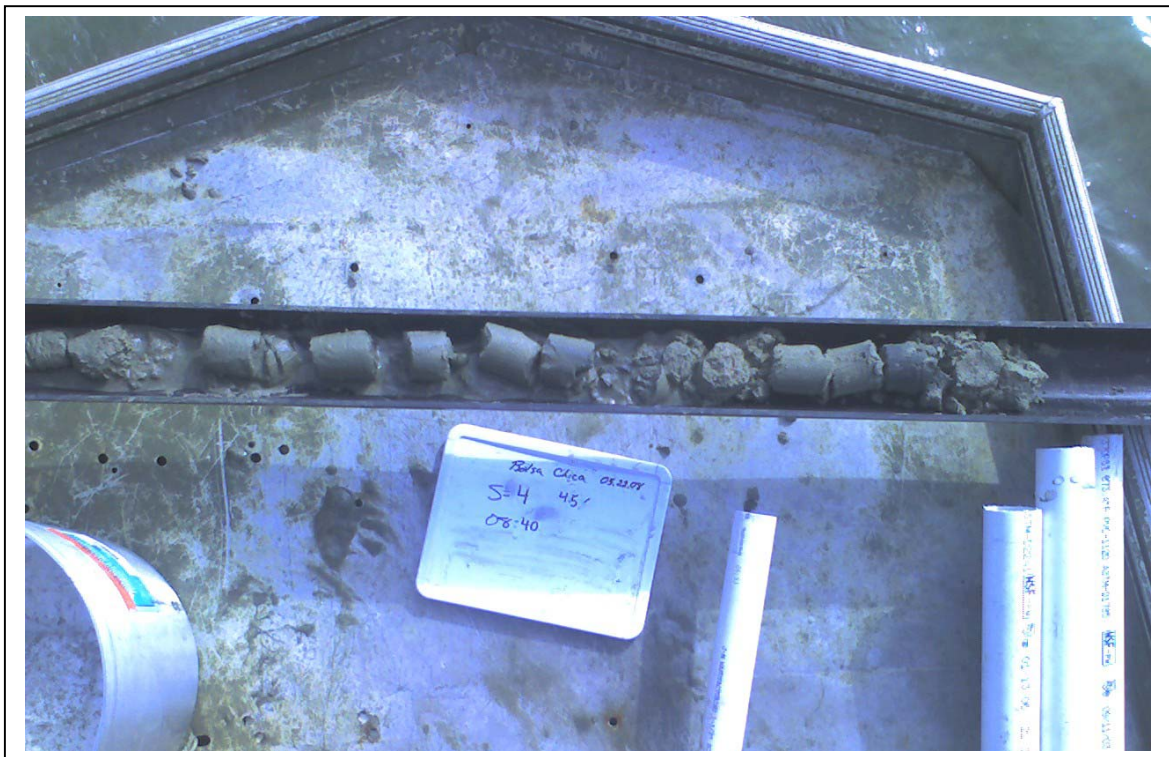


Photo 4. Flood Shoal Location S-4



Photo 5. Flood Shoal Location S-5

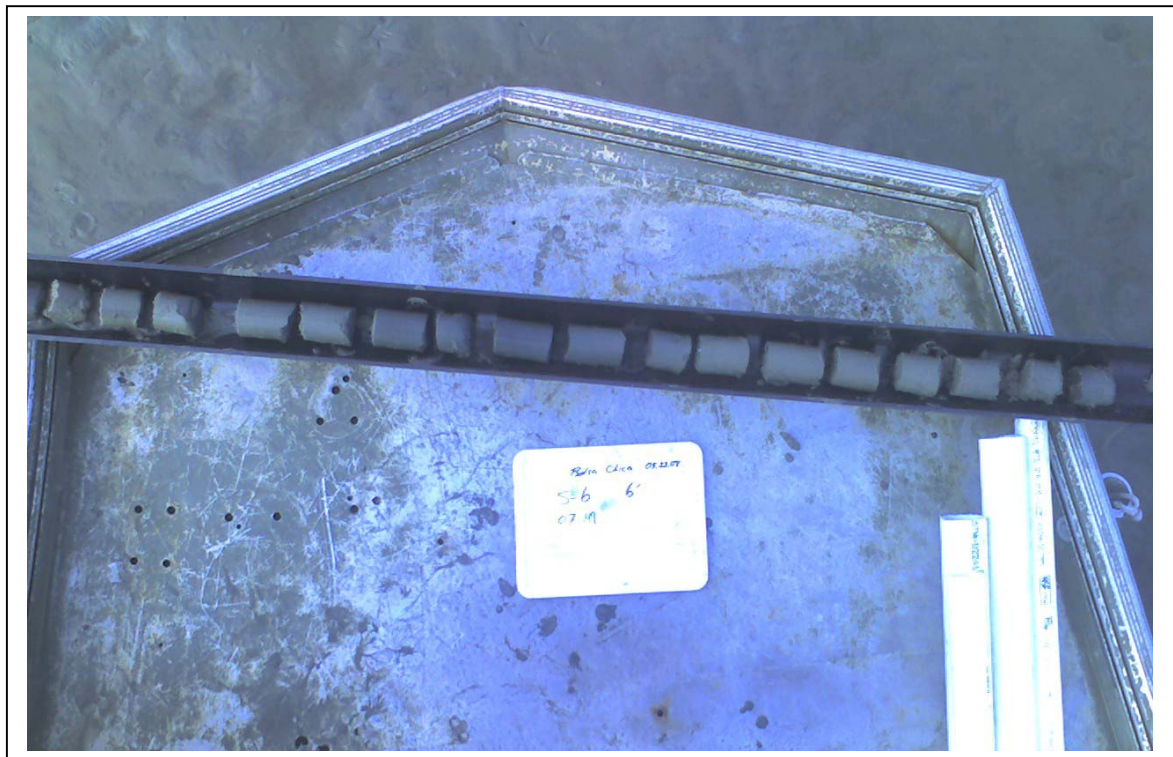


Photo 6. Flood Shoal Location S-6



Photo 7. Flood Shoal Location S-7

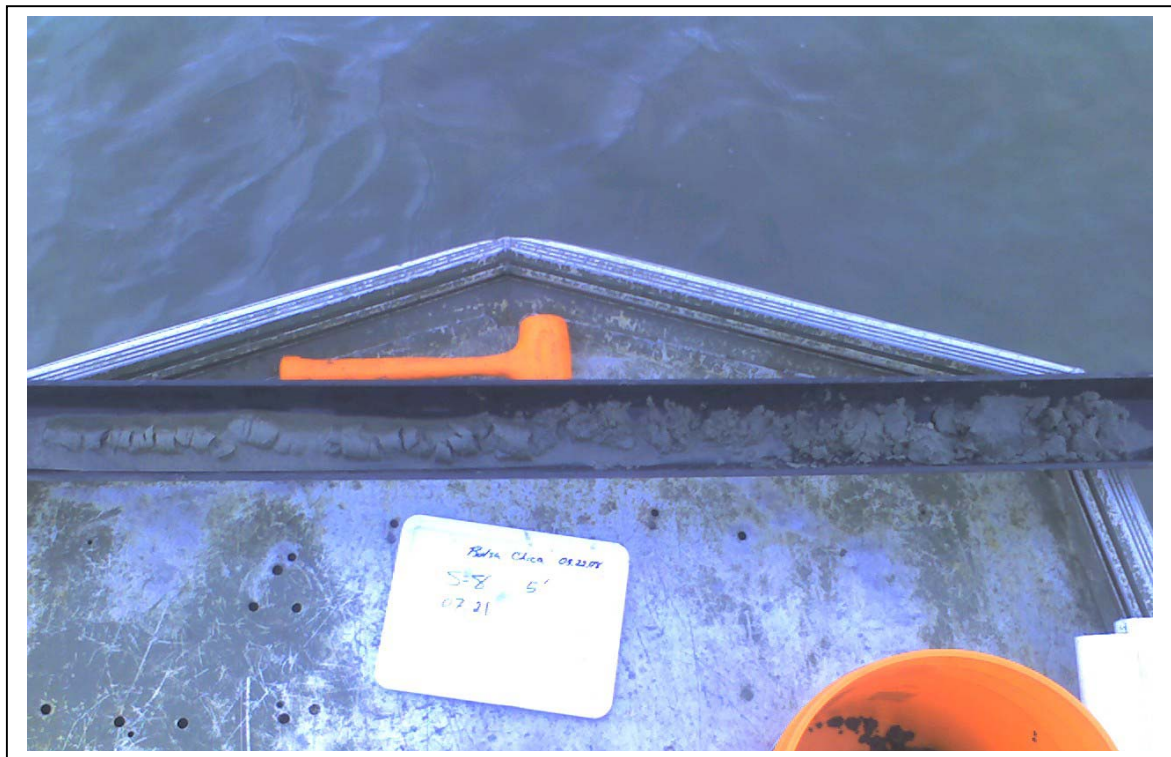


Photo 8. Flood Shoal Location S-8

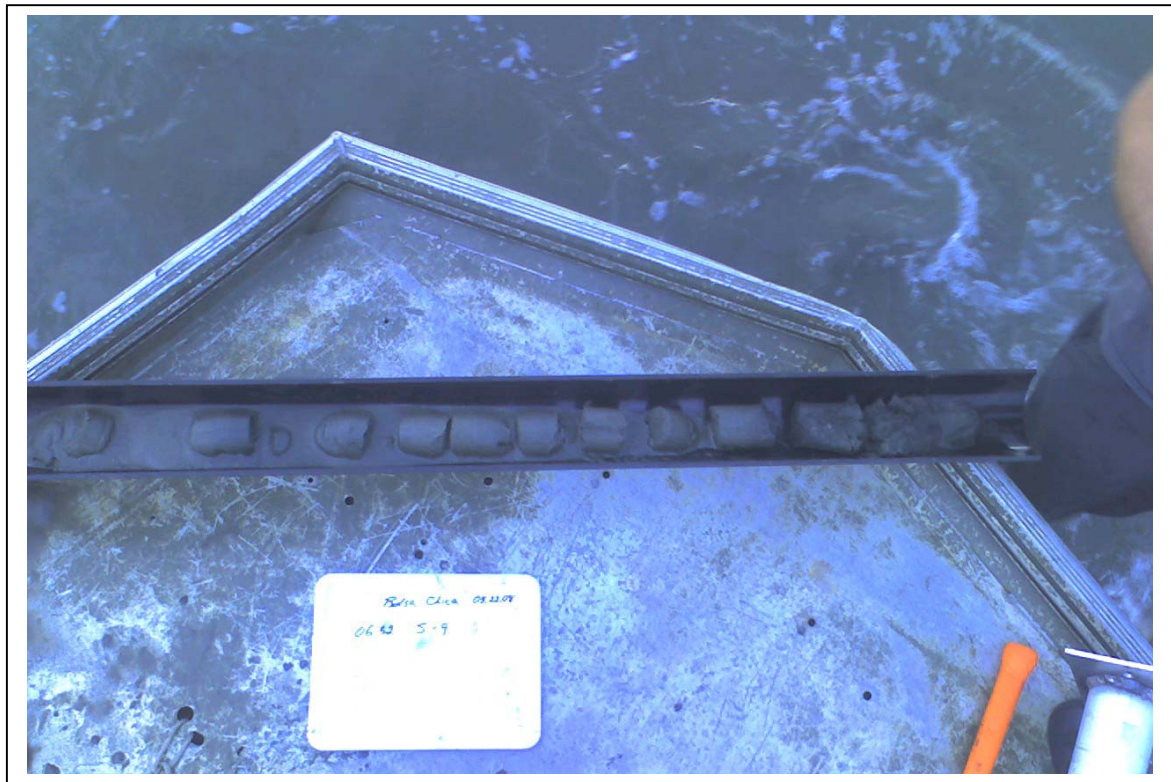


Photo 9. Flood Shoal Location S-9

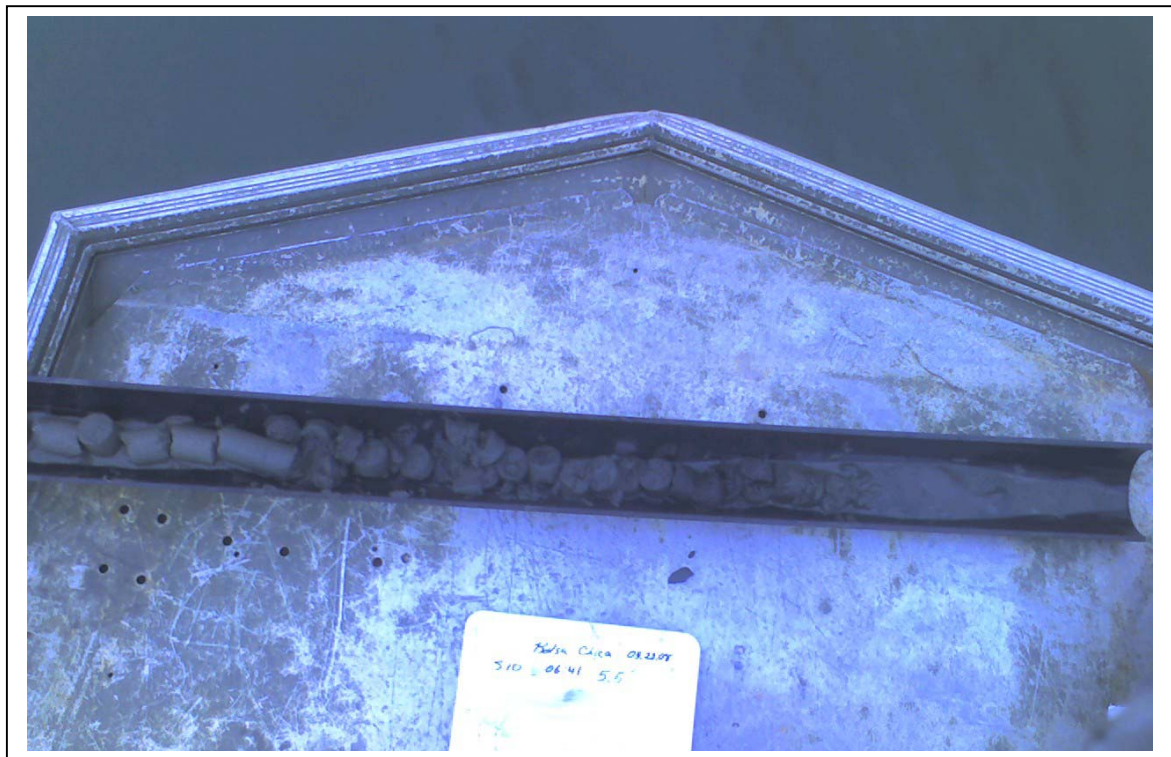


Photo 10. Flood Shoal Location S-10

APPENDIX C

GRAIN SIZING LABORATORY RESULTS

BOLSA CHICA FLOOD SHOAL MAINTENANCE DREDGING 2008

Collection: 22-May-08
Method: ASTM D422-63

Collection: 22-May-08 Method: ASTM D422-63		GRAVEL					SAND						SILT	
		Fine		Very Fine	Very Course	Course		Meduim		Fine		CLAY		
		U.S. Standard Sieve Size												
		Dry Wt.	0.265	4	7.00	10.00	18.00	30.00	40.00	60.00	80.00	140.00	200.00	Pan
Station		Total Wt (g)	Weight retained (g)											
Composite A		86.70	0.00	0.00	0.18	0.20	1.66	3.71	5.06	20.00	20.62	29.99	4.59	0.52
			0.00%	0.00%	0.21%	0.23%	1.91%	4.28%	5.84%	23.07%	23.78%	34.59%	5.29%	0.60%
cumulative %			0.00%	0.00%	0.21%	0.44%	2.35%	6.63%	12.47%	35.54%	59.32%	93.91%	99.20%	99.80%
Composite B		76.60	0.00	0.18	0.13	0.00	1.16	2.25	3.58	15.91	17.48	29.67	5.31	0.77
			0.00%	0.23%	0.17%	0.00%	1.51%	2.94%	4.67%	20.77%	22.82%	38.73%	6.93%	1.01%
cumulative %			0.00%	0.23%	0.40%	0.40%	1.92%	4.86%	9.53%	30.30%	53.12%	91.85%	98.79%	99.79%
R1		82.10	0.00	0.38	0.56	0.39	4.94	14.44	21.82	27.35	6.36	3.66	0.63	0.40
			0.00%	0.46%	0.68%	0.48%	6.02%	17.59%	26.58%	33.31%	7.75%	4.46%	0.77%	0.49%
cumulative %			0.00%	0.46%	1.14%	1.62%	7.64%	25.23%	51.80%	85.12%	92.86%	97.32%	98.09%	98.57%
R2		78.32	0.00	0.00	0.00	0.00	0.06	3.38	19.22	42.92	8.94	3.24	0.07	0.00
			0.00%	0.00%	0.00%	0.00%	0.08%	4.32%	24.54%	54.80%	11.41%	4.14%	0.09%	0.00%
cumulative %			0.00%	0.00%	0.00%	0.00%	0.08%	4.39%	28.93%	83.73%	95.15%	99.28%	99.37%	99.37%
R3		76.26	0.00	0.00	0.00	0.00	0.01	1.11	10.44	34.73	20.01	9.40	0.23	0.01
			0.00%	0.00%	0.00%	0.00%	0.01%	1.46%	13.69%	45.54%	26.24%	12.33%	0.30%	0.01%
cumulative %			0.00%	0.00%	0.00%	0.00%	0.01%	1.47%	15.16%	60.70%	86.94%	99.27%	99.57%	99.58%
R4		85.67	0.00	0.00	0.00	0.01	0.51	3.82	9.49	36.81	23.73	10.53	0.49	0.02
			0.00%	0.00%	0.00%	0.01%	0.60%	4.46%	11.08%	42.97%	27.70%	12.29%	0.57%	0.02%
cumulative %			0.00%	0.00%	0.00%	0.01%	0.61%	5.07%	16.14%	59.11%	86.81%	99.10%	99.67%	99.70%
R5		83.57	0.00	0.00	0.02	0.03	0.35	1.02	1.42	18.53	27.64	30.21	3.71	0.23
			0.00%	0.00%	0.02%	0.04%	0.42%	1.22%	1.70%	22.17%	33.07%	36.15%	4.44%	0.28%
cumulative %			0.00%	0.00%	0.02%	0.06%	0.48%	1.70%	3.40%	25.57%	58.65%	94.79%	99.23%	99.51%
R6		82.53	0.00	0.00	0.24	0.08	0.09	0.14	0.44	3.84	12.30	58.38	6.55	0.37
			0.00%	0.00%	0.29%	0.10%	0.11%	0.17%	0.53%	4.65%	14.90%	70.74%	7.94%	0.45%
cumulative %			0.00%	0.00%	0.29%	0.39%	0.50%	0.67%	1.20%	5.85%	20.76%	91.49%	99.43%	99.88%
R7		82.18	0.00	0.00	0.11	0.16	0.14	0.36	0.67	3.09	9.44	60.34	7.39	0.37
			0.00%	0.00%	0.13%	0.19%	0.17%	0.44%	0.82%	3.76%	11.49%	73.42%	8.99%	0.45%
cumulative %			0.00%	0.00%	0.13%	0.33%	0.50%	0.94%	1.75%	5.51%	17.00%	90.42%	99.42%	99.87%
R8		82.31	3.91	0.17	0.30	0.12	0.10	0.23	0.74	2.46	8.55	57.64	7.65	0.38
			4.75%	0.21%	0.36%	0.15%	0.12%	0.28%	0.90%	2.99%	10.39%	70.03%	9.29%	0.46%
cumulative %			4.75%	4.96%	5.32%	5.47%	5.59%	5.87%	6.77%	9.76%	20.14%	90.17%	99.47%	99.93%
R9		74.65	0.00	0.14	0.07	0.14	1.23	9.28	20.01	32.34	6.91	3.27	0.42	0.34
			0.00%	0.19%	0.09%	0.19%	1.65%	12.43%	26.81%	43.32%	9.26%	4.38%	0.56%	0.46%
cumulative %			0.00%	0.19%	0.28%	0.47%	2.12%	14.55%	41.35%	84.68%	93.93%	98.31%	98.87%	99.33%
R10		86.88	0.00	0.00	0.00	0.05	0.66	9.98	23.49	41.65	7.39	2.61	0.09	0.06
			0.00%	0.00%	0.00%	0.06%	0.76%	11.49%	27.04%	47.94%	8.51%	3.00%	0.10%	0.07%
cumulative %			0.00%	0.00%	0.00%	0.06%	0.82%	12.30%	39.34%	87.28%	95.79%	98.79%	98.90%	98.96%

BOLSA CHICA FLOOD SHOAL MAINTENANCE DREDGING 2008

Collection: 22-May-08
Method: ASTM D422-63

Collection: 22-May-08 Method: ASTM D422-63		GRAVEL					SAND						SILT	
		Fine		Very Fine	Very Course	Course		Meduim		Fine		CLAY		
		U.S. Standard Sieve Size												
		Dry Wt.	0.265	4	7.00	10.00	18.00	30.00	40.00	60.00	80.00	140.00	200.00	Pan
Station R11	Total Wt (g) 84.84	Weight retained (g)												
		0.90	0.49	0.81	1.36	14.38	16.72	9.97	23.13	11.56	4.26	0.23	0.02	
cumulative %		1.06%	0.58%	0.95%	1.60%	16.95%	19.71%	11.75%	27.26%	13.63%	5.02%	0.27%	0.02%	
		1.06%	1.64%	2.59%	4.20%	21.15%	40.85%	52.60%	79.87%	93.49%	98.51%	98.79%	98.81%	
R12		88.14	0.22	0.40	0.26	0.19	3.77	10.93	18.50	30.91	12.94	9.12	0.43	0.01
			0.25%	0.45%	0.29%	0.22%	4.28%	12.40%	20.99%	35.07%	14.68%	10.35%	0.49%	0.01%
cumulative %			0.25%	0.70%	1.00%	1.21%	5.49%	17.89%	38.88%	73.95%	88.63%	98.98%	99.47%	99.48%
R13		78.62	0.00	0.00	0.07	0.11	0.56	1.16	1.64	15.08	24.93	30.88	3.79	0.22
			0.00%	0.00%	0.09%	0.14%	0.71%	1.48%	2.09%	19.18%	31.71%	39.28%	4.82%	0.28%
cumulative %			0.00%	0.00%	0.09%	0.23%	0.94%	2.42%	4.50%	23.68%	55.39%	94.67%	99.49%	99.77%
R14		87.23	0.11	0.22	0.55	0.07	0.15	0.32	1.09	3.19	9.80	64.52	6.87	0.35
			0.13%	0.25%	0.63%	0.08%	0.17%	0.37%	1.25%	3.66%	11.23%	73.97%	7.88%	0.40%
cumulative %			0.13%	0.38%	1.01%	1.26%	1.26%	1.63%	2.88%	6.53%	17.77%	91.73%	99.61%	100.01%
R15		90.68	0.00	0.33	0.08	0.05	0.20	0.57	0.56	3.26	10.17	66.99	8.10	0.34
			0.00%	0.36%	0.09%	0.06%	0.22%	0.63%	0.62%	3.60%	11.22%	73.88%	8.93%	0.37%
cumulative %			0.00%	0.36%	0.45%	0.51%	0.73%	1.36%	1.97%	5.57%	16.78%	90.66%	99.59%	99.97%
R16		83.68	0.00	0.00	0.17	0.08	0.10	0.25	0.80	2.44	9.69	61.87	7.74	0.39
			0.00%	0.00%	0.20%	0.10%	0.12%	0.30%	0.96%	2.92%	11.58%	73.94%	9.25%	0.47%
cumulative %			0.00%	0.00%	0.20%	0.30%	0.42%	0.72%	1.67%	4.59%	16.17%	90.11%	99.35%	99.82%